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\documentclass[11pt]{article}

% ---------- Fonts & Encoding (prevents black squares) ----------
\usepackage[T1]{fontenc}
\usepackage[utf8]{inputenc}
\usepackage{lmodern}

% ---------- Math & Symbols ----------
\usepackage{amsmath,amssymb}
\usepackage{siunitx}

% ---------- Layout ----------
\usepackage[a4paper,margin=1in]{geometry}
\usepackage{setspace}
\setstretch{1.15}

% ---------- Metadata ----------
\title{Lattice-Enhanced Screening Parameterization (v3, Final)}
\author{Prepared for archival reference}
\date{January 17, 2026}

\begin{document}
\maketitle

\section*{Appendix A --- Definitions and Assumptions}
```

This appendix is added to resolve completeness requirements identified during formal mathematical review. No changes are made to the core equations.

\subsection*{Symbols and SI Units}

\begin{itemize}
\item E : center-of-mass kinetic energy (J)
\item $U_e,\,U_0$: screening energies (J)
\item $S(E)$: astrophysical S-factor (J\,m^2)
\item σ_{eff} : effective cross-section (m^2)
\item $v(E)$: relative velocity, $v=\sqrt{2E/\mu}$ (m\,s^{-1})
\item μ : reduced mass (kg)
\item Z_1, Z_2 : nuclear charge numbers (dimensionless)
\item e : elementary charge (C)
\item ε_0 : vacuum permittivity (F\,m^{-1})
\item $\hbar$: reduced Planck constant (J\,s)
\item $p(E)$: normalized energy probability density (J^{-1})
\item n_1, n_2 : number densities (m^{-3})
\item Q : reaction energy per event (J)
\end{itemize}

\subsection*{Assumptions}

\begin{itemize}
\item Non-relativistic regime.
\item Center-of-mass frame used consistently.

\item Single-channel scattering approximation.

\item Energy probability density is normalized:

\[

\int_0^{\infty} p(E)\,dE = 1

\]

\item Screening modifies reaction \emph{probability only}; it is not an energy source.

\item Any energy required to establish or maintain screening is included in

P_{in} or P_{stored}.

\item $U_0 > 0$ is preferred for numerical stability; if $U_0=0$,

standard Coulomb tunneling asymptotics ensure integrability as $E \to 0$.

\end{itemize}

\section*{Status Statement}

The model is phenomenological, dimensionally consistent, energy-conserving,

and mathematically well-posed. Physical validity is to be determined

experimentally; no experimental claims are asserted here.

\end{document}